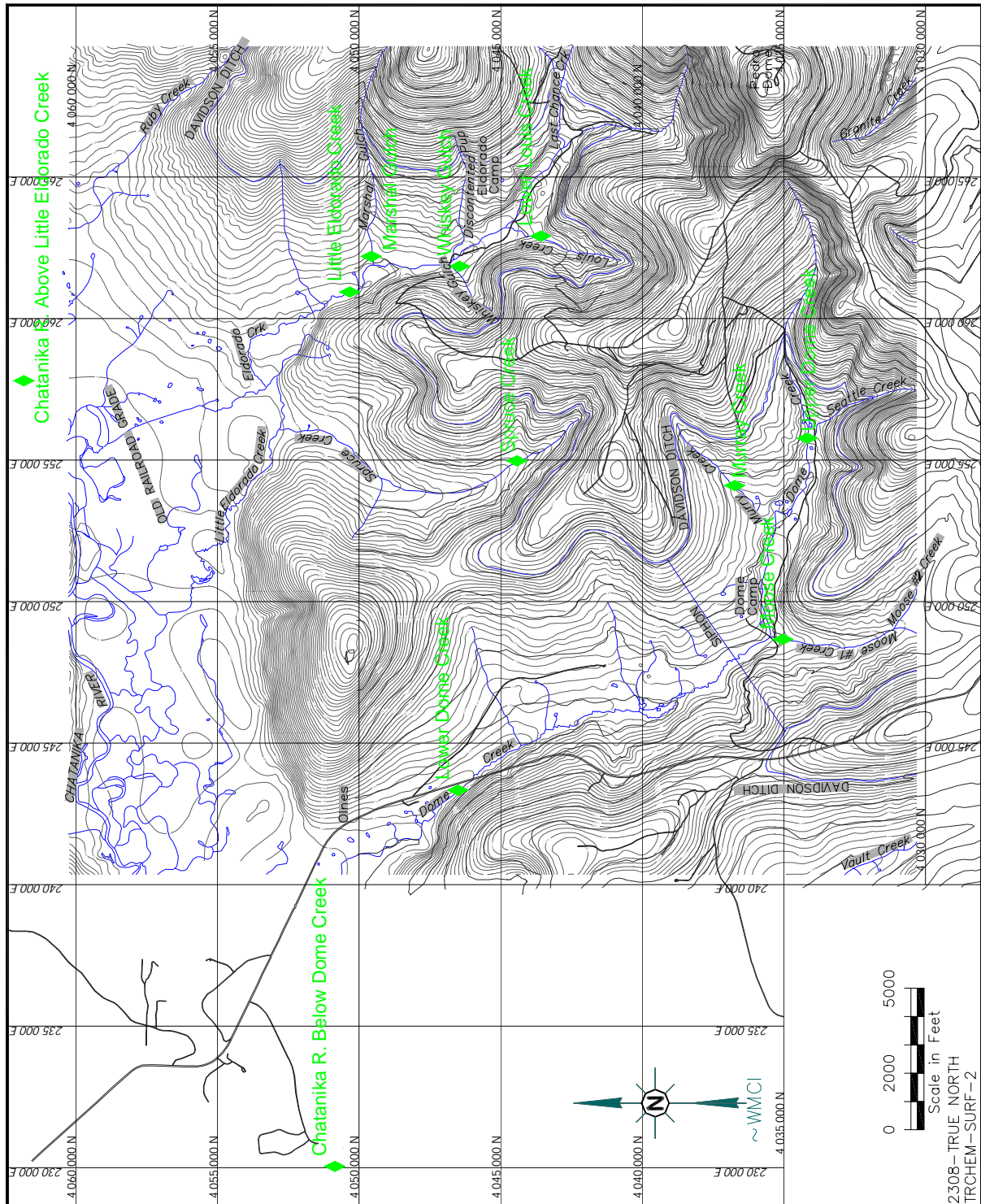


Surface water sampling locations



## **APPENDIX D**

### **TRUE NORTH PROJECT QA/QC & Field Procedures Manual**

**TRUE NORTH PROJECT  
QUALITY ASSURANCE/QUALITY  
CONTROL  
AND  
FIELD PROCEDURES MANUAL**

**September 2000**

**True North Project  
Fairbanks, Alaska  
Quality Assurance/Quality Control and Field Procedures Manual**

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## 1.0 INTRODUCTION

### 1.1 Objectives

This Water Monitoring QA/QC and Field Procedures Manual is for the use of Fairbanks Gold Mining, Inc. (FGMI) operating personnel at the True North Project. This manual will be used to maintain the quality of field activities, sample collection, sample handling, laboratory analysis and data analysis, and to document the quality of data at each processing level. The QA/QC program identifies major aspects of the project requiring specific quality control and demonstrates that quality control is a major focus for this project. Additionally, this manual will be used for training employees in approved field monitoring procedures (i.e. instrument calibrations, measurements, maintenance).

This document will be periodically reviewed and updated by site personnel to reflect actual site conditions and permit monitoring requirements as they change.

### 1.2 Quality Assurance/Quality Control Program

The QA/QC program consists of three components:

- **Field QA/QC** identifies the procedures to be used in the field to verify that water samples and field monitoring data are collected according to the requirements of the project. The objective of field QA/QC is to assure that both field measurements and samples collected for laboratory analyses can be demonstrated to be representative of the environment sampled and are of known and acceptable quality.
- **Laboratory QA/QC** identifies the protocols to be used by the laboratories to demonstrate that project data are analyzed according to U.S. Environmental Protection Agency (EPA)-acceptable methodologies, and that reported values are accurate. The objective of the laboratory QA/QC program is to produce data that will meet state and federal analytical requirements.
- **Data QA/QC** identifies the protocols to be used to verify that laboratory and field data have been reported accurately. The objective of the data QA/QC program is to demonstrate that the data reported meet the specified requirements, including comparability with data from previous years.

### 1.3 Data Uses and Data Quality Objectives

Quality assurance requirements are established in this QA/QC program to achieve the project objectives for the data uses. Applicable quality control procedures, quantitative target limits, and level of effort for assessing the data quality are dictated by the intended use of the data and the nature of the required field and analytical methods. The project objectives are to collect data of known

and sufficient quality for FGMI to comply with the analytical permit requirements during operation and ultimately closure of the True North Project. The analyses to be conducted on the various sample types have been presented in the True North Project Monitoring Manual. Protocols and appropriate detection limits are included in the laboratory's QA/QC plan available to all FGMI environmental personnel.

Federal and state levels of concern (i.e. ambient water quality criteria or maximum contaminant levels) exist for many of the parameters being analyzed in the water monitoring program. To the extent possible, analytical methods have been specified that will allow detection of chemical constituents at or below levels of concern.

## **1.4 Data Quality Parameters**

The quality of laboratory data is measured by the precision, accuracy, representativeness, comparability, and completeness of the data. These parameters and the applicable quality control procedures and levels of effort are described below.

### **Precision**

Precision is a qualitative measure of the reproducibility of a measurement under a given set of conditions. For duplicate measurements, analytical precision can be expressed as the relative percent difference. A quantitative definition of the relative percent difference is included in Appendix A. The level of effort for precision measurement will be at a minimum frequency of one in 20 (5 percent) or one per batch, whichever is more frequent.

### **Accuracy**

For samples processed by the analytical laboratory, accuracy will be evaluated through the use of matrix spikes and standard reference materials (SRMs) to establish the average recovery. A quantitative definition of average recovery is included in Appendix A. The laboratory will perform matrix spike and matrix spike duplicate measurements at a minimum frequency of one in 20 samples for organic parameters, and matrix spikes of one in 20 for inorganic or miscellaneous samples, or one per batch, whichever is more frequent.

### **Representativeness, Precision and Accuracy**

Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of the chemical compounds in the soil and water sampled. Sampling plan design, sampling techniques, and sample handling protocols (e.g., storage, preservation, and transportation) have been developed and are discussed in other sections of this document. Proposed documentation will establish that protocols have been followed and sample



identification and integrity assured. Field blanks (Profile III only) and field duplicates obtained at a minimum frequency of 5 percent or one per Sample event will be used to assess field and transport contamination and method variation. Laboratory sample retrieval, storage, and handling procedures have also been developed and are discussed in other sections of this document. Laboratory method blanks will be run at the minimum frequency of 5 percent or one per set to assess laboratory contamination.

### Comparability

Comparability is the level of confidence with which one data set can be compared with another. Comparability of the data will be maintained by using EPA-defined procedures, where available and appropriate. Comparability will also be maintained by the use of consistent units.

### Completeness

Completeness is a measure of the amount of valid data obtained from the measurement system. The quantitative definition of completeness is given in Appendix A. The target completeness objectives are approximately 90 percent for each analytical parameter; the actual completeness can vary with the intrinsic nature of the samples. The completeness of the data will be assessed during the data review.

## **2.0 FIELD QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES**

### **2.1 Purpose**

Producing data of known quality that are considered representative of the sampling environment at an appropriate level of detail is achieved by establishing a QA/QC program with specified data gathering protocols overseen by a field QA/QC leader (Environmental Engineer). The main components of the proposed QA/QC program include the following:

- Verification of use of proper sample containers and preservatives
- Collection and analysis of blank and duplicate samples
- Specific procedures for handling, labeling, and shipping samples
- Field equipment calibration
- Equipment decontamination
- Field documentation
- Field corrective action

Each task sampler is responsible for implementing these components in the field. However, the field QA/QC leader will oversee each aspect of field operations to verify that these components are accomplished within the strict requirements of the project.



## **2.2 Quality Control Samples**

To aid in evaluating the accuracy of the analytical data, a field filter and rinse blank and duplicate sample are collected and subjected to the same analyses as identified in task samples. One field filter and rinse blank is collected for every 20 unknown samples, or one per sampling event (quarterly), whichever is greater. In addition, a minimum of one duplicate sample is collected for every 20 task samples, or one per sampling event (quarterly), whichever is greater.

Equipment blanks for surface water sampling are taken by pouring distilled water into a decontaminated sample collection bucket, then samples bottles are filled from the sample collection bucket with a decontaminated one-liter plastic pitcher. Blanks will be analyzed along with the unknown samples.

## **2.3 Sample Collection, Labeling, and Handling Procedures**

Sample collection, labeling, and handling procedures are periodically checked by the QA/QC leader (Environmental Engineer) to verify that the following conditions are being met:

- Collection -- Samples are collected according to approved sampling methods.
- Labeling -- Samples are uniquely labeled using a code that prohibits unauthorized personnel from knowing the sampling locations.
- Packaging -- Samples are correctly packaged to prevent leakage or cross-contamination; Sample containers with proper preservatives are used; Amber sample bottles for UV protection are used when necessary.
- Chain-of-custody forms -- Chain-of-custody forms are properly completed to assure sample custody can be adequately documented.
- Shipping -- Samples are hand delivered to the laboratory or proper shipping procedures are used, including maintenance of proper temperatures and specified holding times.

Each task leader is responsible for implementing the proper sample collection, labeling, and handling procedures. The field QA/QC leader will oversee these activities.

### 2.3.1 Surface Water Grab Sampling

Surface water samples are collected in the following order:

1. Total and dissolved metals
2. Settable solids
3. Total suspended solids
4. TPH
5. Ammonia nitrogen
6. Miscellaneous parameters (i.e. fluoride, phosphorous, etc.)

Below, the surface water grab sampling procedure and sampling sites are listed.

1. Decontaminate compositing container (plastic bucket) and one-liter pitcher. See section 2.3.12 for decontamination procedures.
2. Locate sampling site at a point in the stream exhibiting greatest flow and/or highest velocity, if possible.
3. Surface water sample sites at the True North Project require filling the plastic-bucket by direct submergence.

When submersion is required; submerge plastic-bucket at sampling point such that mouth of container is under water surface at least 2 to 3 inches, if possible. Allow container to fill partially; rinse container by shaking, then discharge this water. Repeat this procedure three times. Collect sample, and then transfer water from plastic-bucket into the sample bottles with one-liter pitcher.

Dissolved metal bottles are field filtered with a 0.45 µm filter. See Appendix A (Section 2.1.1) for complete surface water field filtering procedure.

Note that when sampling TPH (amber glass bottle), the sample bottle must be submerged in the plastic bucket so that its mouth is half out of the water when filling. Alternatively the sample bottle may be filled by submersion directly into the sample water, provided the mouth of the sample bottle isn't fully submersed.

4. Fill out appropriate field data form(s) see documenting sample location, time, and other pertinent information before leaving sample site.

### 2.3.2 Surface Water Grab Sampling Through Ice

During winter months when ice cover is present, sample water is accessed with use of a manual handheld ice auger.

1. Clear snow off ice, an area large enough area for sampling equipment.
2. Drill sample hole in ice with auger periodically cleaning hole of ice chips.
3. After breaking through ice, cut a square area with an ax around the ice hole large enough (3-4" deep) to dip sample collection container in.
4. Purge three hole volumes from the ice hole prior to sampling, trying to remove all ice chips within the hole. This volume can be approximated from the hole-dimensions in the ice.
5. Follow surface water grab sample procedure steps 3 –4 Surface Water Grab Sample Procedure.

### 2.3.3 Groundwater Sampling

Groundwater sampling procedures are listed below.

The monitoring wells are sampled with a portable submersible Grundfos electric pump. A description of the sampling procedure is given below.

1. Adjust the reel support pins (on bar below roller) so that the roller is centered over the well opening. Lift and hang the REEL E-Z on the well casing by resting the support pins against the inside of the well casing.
2. Unlock the reel by pulling the pin lock mechanism outward and turning.
3. Using the operating handle gently reel down the pump to the necessary level and lock the reel in place. The cable is marked every five feet.
4. **DO NOT power the converter until the extension cord is connected.** Connect the extension cord to the electrical box. Connect the other end of the extension cable to the Grundfos MPI converter.
5. Connect the discharge hose to the discharge port.
6. Power up the MPI converter (220/240 V - 5KW generator), turn the frequency control knob to approximately mid-range (12 o'clock position) and start the pump by moving the start/stop switch to the "start" position. Adjust the speed dial to the desired frequency or flow rate.
7. Purge at least three well casing volumes prior to sampling, taking field parameters (pH, conductivity, and temperature) at each casing volume.

After finishing purging and if field parameters were stable, fill sample bottles directly from sample discharge hose. If field parameters were unstable during well purging, continue purging well until stable field parameters are achieved. Fill out appropriate field data form(s) documenting sample location, time, and other pertinent information before leaving sample site.

8. When finished pumping, move the start/stop switch to the “stop” position. Turn off the generator. Disconnect the extension cord.
9. Disconnect the discharge hose, unlock the reel, and rewind the hose and pump back onto the reel.

### **2.3.4 Solids Sampling Procedure**

#### **Quarterly Development Rock Acid/Base Accounting**

As part of the mining operation, blast hole drills bore 63/4-inch diameter holes to a depth of 23 feet into schist and granite bedrock within the open pit prior to blasting and loading operations. The holes are drilled on 17-foot centers using air rotary drilling methods. Generally 50-200 drill holes are drilled. The holes are loaded with explosives and detonated in one shot or blast pattern.

During drilling operations a device located near the drill steel, holds a sample container and collects approximately 7-15 kilograms of cuttings from the borehole. Each sample represents a block of approximately 440 tons of mine material. The sample is collected in a cloth sack, labeled with a bar code to identify the drill hole where sample was collected. These samples are taken to the FGMI assay lab (at Fort Knox) to determine the gold content by classical fire assay techniques. Based on analytical results, the block is zoned, by grade. If the grade of the material is less than 0.0018 oz Au per ton of ore, it is classified as development material and is placed in the appropriate development rock dump.

Following the determination of ore/waste for the material, assay laboratory personnel will store an assay pulp sample of development material from each blast pattern. These samples will be collected throughout the calendar year. Environmental Services personnel will then form a composite sample using approximately 7 grams from each sample. This composite sample will be forwarded to the contract laboratory for analysis. The remaining samples will be held until the results from the lab are received. Following receipt of the results of analysis the remaining samples will be discarded. If the analytical results vary significantly from previous sampling events, another composite sample will be formed, or samples from individual blast holes will be collected and shipped to the laboratory for analysis.

## **Annual Meteoric Water Mobility**

The ore control engineer and mine geologist will provide information on a quarterly basis relating to tonnage of development rock mined and placed in dumps over the previous three-month period. The following factors will be considered in collecting a representative sample for the annual composite sample:

- Lithological variation.
- Mineralogical variation.
- Extent of “sulfide” mineralization.
- Color variation.
- Degree of fracturing.
- Degree of oxidation.
- Extent of secondary mineralization.

Collect a representative sample of the material. The minimum sample size for this procedure is 5 kilograms. The maximum particle size for sample material is equal to or less than 5 centimeters. All quarterly samples collected are to be saved and representatively composite during the year for evaluation. Splits of the quarterly samples will be composited and submitted to the contract laboratory to evaluate the potential to release pollutants by the Meteoric Water Mobility Procedure.

### **2.3.5 Sample Labeling**

Labeling. Each sample container will have a waterproof label large enough to contain the information needed to easily identify each sample. The information to be included on each label includes the project name, date, time, preservative (if added), and sampling code. The sample code will be formatted to indicate sample number and date. In the field record book, the sampler identifies each sampling location. Each sample will be identified with a 12-digit number, which includes the date, and identification number of the sample. An example of sample identification is as follows:

990506038101

Where:

990506 = Date (May 6, 1999)

038 = Employee’s identification number

101 = Sequential sample number recorded in logbook for that date

All blanks and duplicates will be noted in the field notebook. The following designation will be noted where natural samples are identified as 100 series, blanks as 200 series, and duplicates as 300 series.

### **2.3.6 Packaging**

Each analytical sample bottle will be packed to prevent breakage and placed in an iced cooler to keep the samples cooled to 4°C. For hand delivered and shipped samples one copy of the chain-of-custody form will be placed in a sealed plastic bag. Additionally, for shipped samples, the cooler lid will be sealed with fiber tape and at least one chain-of-custody seal will be attached to the outside of the cooler so that this seal(s) must be broken if the cooler is opened. Before sealing coolers, the field QA/QC leader (Senior Environmental Engineer) will inspect sample packaging.

### **2.3.7 Chain-of-Custody**

Chain-of-custody forms will be used for all samples. Once collected, the samples will remain within the custody of the sampler or will be locked up until the samples are prepared for shipment. Each time the sample bottle or sample changes hands, both the sender and receiver will sign and date the chain-of-custody form and specify what samples have changed hands. The pink carbon copy of the chain-of-custody form is retained by FGMI and the original (white) and yellow carbon copy is sent to the laboratory. The laboratory will forward the original to FGMI.

The following information is to be included on the chain-of-custody form:

- Sample identification code
- Signature of sampler
- Date and time of collection
- Project name
- Type of sample
- Number and type of containers
- Sample analysis requested (Profile I, II, III, Acid/Base Accounting, etc.)
- Inclusive dates of possession
- Signature of receiver

Other chain-of-custody components will include sample labels, sample seals, field notebook, sample shipment receipts, and the laboratory logbook noting the Analytical profiles I, II, and/or III.

### **2.3.8 Shipping**

FGMI personnel or courier will deliver samples to the designated laboratory as soon as feasible after collection. If a courier is used, a signed receipt from the courier acknowledging receipt of the samples will be attached to the FGMI's copy of the chain-of-custody form.

### **2.3.9 Field Documentation**

Field observations, field equipment calibration information, field measurements, and sample documentation, including sample identification, sample duplicates, and date and time the sample was collected, will be the responsibility of the entire sampling team. Field logbooks will consist of waterproof paper.

Proper documentation for sample custody includes keeping records of all materials and procedures involved in sampling. Project notebook and data sheets will be used to record field data. The field crews will record all information on the sampling station and respective samples and replicates collected at each site, including the positions of each station. The field crew leader will review all data before leaving the sampling station. Completed field logs will be kept on file for any QA/QC checks. Additionally, the field QA/QC leaders will inspect all field documentation notebooks and data sheets regularly.

### **2.3.10 Corrections to Documentation**

Unless weather conditions prevent it, all original data will be recorded using waterproof ink. No accountable documents will be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on an accountable document assigned to one person, that person must make corrections by drawing a line through the error, initialing and dating the lined-out item, and entering the correct information. The erroneous information is not to be obliterated but is to remain legible. The person who made the entry will correct any subsequent error discovered on an accountable document. All such subsequent corrections will be initialed and dated.

### **2.3.11 Field Equipment Calibration**

Field equipment used for collection, measurement, and testing is subject to a strict program of control, calibration, adjustment, and maintenance. (See Appendix A) Portable water quality instruments will be used for the in situ measurement of pH, temperature, dissolved oxygen, and conductivity. Recorded measurements will not be taken until an agreement of replicate measurements is obtained. This value will then be recorded. Calibrations will be performed daily prior to beginning any sample tasks. The standards of calibration are in accordance with applicable criteria such as the NIST (National Institute of Standards Technology), ASTM standards, or other accepted procedures outlined in the manufacturer's handbook of specifications. All calibration activities will be documented in each task notebook, as well as on appropriate field calibration forms.

The field crew leader will review data measured in the field, and final validation will be by senior personnel. Data validation will be completed by checking procedures used in the field and comparing the data with previous results. Data



that cannot be validated will be so documented; corrective action may be required, as discussed later.

### **2.3.12 Decontamination Procedures**

All sample processing tools, such as pumps, buckets, and hoses, which come into contact with a sample will be decontaminated by means of the following procedure:

1. Rinse in water
2. Wash with Alconox, or equivalent, in tap water
3. Double rinse in de-ionized water, and, if not to be used right away,
4. Air-dry
5. Place in plastic bag immediately after air-drying

The purpose of the water and Alconox, or equivalent, washes is to remove all visible particulate matter. This is followed by a de-ionized water rinse to remove the detergent. It is not anticipated that high concentrations of TPH will be sampled. If visible contamination is found, a solvent rinse will be added, followed by a de-ionized water rinse.

### **2.3.13 Field Corrective Action**

Field sampling corrective actions include procedures to follow when field data results are not within the acceptable error tolerance range. These procedures include the following:

- Comparing data readings being measured with readings previously recorded
- Recalibration of equipment (i.e., pH meters)
- Replacing or repairing faulty equipment
- Resampling when feasible

The field team leader is responsible for ordering appropriate field corrective actions when deemed necessary. All field corrective actions will be recorded in the field book.

### **3.0 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL PROGRAM**

The laboratory QA/QC program is available to all FGMI personnel and a copy is also located in the FGMI library.

### **4.0 DATA QUALITY ASSURANCE/QUALITY/QUALITY CONTROL PROGRAM**

The data QA/QC program serves four major functions:

- Maintenance of a duplicate record of all field data
- Sample tracking through laboratory analysis
- Data validation
- Oversight of data management

During field operations, the field QA leader will receive copies of all field data and will file these in a project notebook. These duplicates will serve as a backup file and will be checked against the field data entered into the database management system.

The second major component of the data QA/QC program is sample tracking throughout the laboratory analytical process. The data QA/QC leader will maintain close communication with all analytical laboratories to verify sample receipt, proper sample management, and strict adherence to sample holding times. The laboratories will immediately inform the field QA leader of sample breakages, inadequate sample media to meet QA objectives, and other sample problems. The field QA leader will then notify the task leader and project manager so that corrective action can be implemented as deemed necessary.

Following the receipt of the analytical data package, the QA leader will verify that all sample parameter data have been received and will compare detection limits and preliminary results with previous results. Should major discrepancies be found, the field QA leader will communicate these to either or both the task leader and project manager. Possible corrective measures will then be evaluated as deemed necessary.

A data review or validation process will also be performed on 20 percent of all analytical data received from the laboratories. Chemical data will be reviewed with regard to the following:

- Analytical methodology
- Detection limits
- Cross-contamination as indicated by blank data
- Accuracy and precision
- Adherence to holding times

Where data do not meet the requirements specified in this QA/QC program, the data will be flagged with qualifiers. These reviews of data will be summarized and included in the report of sampling data.

## **APPENDIX A**

of the

### **TRUE NORTH PROJECT QUALITY ASSURANCE/QUALITY CONTROL AND FIELD PROCEDURES MANUAL**

## **Instrument Calibration, Operation, and Maintenance Procedures**

The following sections discuss field sampling procedures and instrument calibration, maintenance, and measurements.

### **1.1.1 Electrical Conductance**

#### **Instrument Calibration**

At the beginning of each day of sampling, check instrument linearity.

1. Rinse probe with deionized water.
2. Measure conductivity of two potassium chloride (KCl) solution standards, which bracket expected sample values.
3. Measure temperature of both KCl solution standards.
4. Calculate cell constant for each standard to determine if instrument linearity is reasonable. The cell constant is the ratio of the computed conductivity to the measured conductivity of the standard KCl solution.

#### **Maintenance**

1. Store meter in its case during transport.
1. Check batteries before taking meter into the field. Carry spare batteries in the field (9 volt).
2. Inspect conductivity probe for cracks or other damage.

#### **Field Measurement Procedures**

1. Turn instrument on.
2. Rinse plastic beaker with approximately 50 milliliters of sample water three times.
3. Place water sample in plastic beaker (fill to at least 50 millimeters).
4. Rinse probe with deionized or sample water and place in sample water.
5. Immerse conductivity probe in sample so that vent hole is submerged. Move probe around in sample to displace any air bubbles. Turn instrument on to

appropriate scale to measure conductivity. Record conductivity reading after a stable reading is obtained.

6. Remove probe from sample and turn off instrument.

### **1.1.2 Field pH**

#### **Instrument Calibration**

1. Calibrate pH meter at the beginning of each day of field work when pH will be measured, and whenever the standard check is out of acceptable bounds.
2. Rinse pH electrode probe with deionized water.
3. Immerse electrode and temperature probe in beaker of fresh commercial calibration solution of pH 4.0. Calibrate meter to solution.
4. Remove electrode and temperature probe from solution, and then rinse with deionized water.
5. Immerse electrode and temperature probe in fresh pH 10.0 solution. Calibrate meter to solution.
6. Remove electrode and temperature probe from solution, and rinse with deionized water.
7. Measure pH of a third fresh calibration solution at pH 7.0. If measured value differs from expected value by more than 0.1 units, obtain fresh calibration solutions and recalibrate. If discrepancy persists, begin trouble-shooting procedures following meter operating instructions: check batteries, connections, probe, etc.

#### **Maintenance**

1. Store meter in its case with electrode immersed in a pH 7 buffer solution.
2. Inspect electrode prior to use.
3. Filler hole plug should be firmly seated when meter is stored for a week or more.
4. Check glass electrode for cracks or scratches.
5. Check batteries each time meter is used. Carry a spare battery pack into the field in the pH meter case.

## **Field Measurement Procedures**

1. Rinse decontaminated glass beaker or sample bottle with approximately 50 milliliters of sample water three times.
2. Rinse pH electrode with deionized water.
3. Rinse pH electrode with deionized water.
4. If measurement is read ex situ, fill beaker with sample water.
5. Immerse electrode and temperature probe in sample while swirling the sample to provide thorough mixing. Turn on meter. Read pH to nearest 0.1 until the reading has stabilized (when beaker icon stops flashing) .
6. Record sample pH. Note any problems such as erratic readings.
7. Rinse probe with deionized water and store according to manufacturer's directions.

### **1.1.3 Water Temperature**

#### **Linearity and Field Measurement Procedures**

1. Use either a National Institute of Standards and Technology (NIST)-calibrated thermometer or a digital temperature probe calibrated against an NIST-calibrated thermometer to measure temperature.
2. Check thermometers for cracks or gaps in the mercury. Do not use thermometers if either cracks or gaps are visible.
3. When possible, measure temperature of surface water at midstream by submersing the thermometer or electronic temperature probe for approximately 1 minute or until temperature stabilizes.
4. When in situ temperature measurements are not possible, draw sample of at least 200 ml into a decontaminated beaker or sample bottle as soon after sampling as possible.
5. Place thermometer or electronic temperature probe in sample and allow temperature to stabilize.
6. Record temperature to nearest 0.5°C in field logbook or on field data sheet.



7. Rinse thermometer or electronic temperature probe with deionized water.
8. Check field thermometers or digital temperature probes against an NIST-certified laboratory thermometer, on a quarterly basis. Agreement should be within 0.5°C.

#### 1.1.4 Dissolved Oxygen

##### Instrument Calibration

Calibrate probe and dissolved oxygen meter in accordance with manufacturers instrument operating procedures, as follows:

1. Switch instrument to OFF and adjust meter to mechanical zero.
2. Switch to red line and adjust.
3. Prepare probe for operation (keep in moist paper towel **taking care that paper towel doesn't touch membrane**), plug into instrument, turn ON and **wait 15 minutes for probe to stabilize** (temperature).
4. Switch to ZERO and adjust.
5. Adjust salinity knob to FRESH.
6. Switch to TEMP and read.
7. Use probe and true local atmospheric pressure (feet above MSL) to determine correct calibration values from Table I and II (see instrument back panel) for example calculation.
8. Switch to desired dissolved oxygen range 0-5, 0-10, 0-20 and with calibrate control adjust meter to correct calibration value determined in step 7.
9. **It is important that the instrument not be turned off between measurements as it will then need to be recalibrated if turned off.**

##### Maintenance

The probe membrane must be replaced prior to sampling. There should be no cracks, tears, or wrinkles in the membrane as well as no air bubbles in the KCL solution filled probe tip. Also any extra membrane should be cut to avoid covering the stainless steel temperature sensor. Store the probe in a saturated piece of cloth or paper towel.

## **Field Measurement Procedures**

1. When possible, place probe directly into the stream or water to be measured. If this is not possible, place probe into Teflon sample container filled with sample. Manually raise and lower probe through sample about 1 foot per second. Allow sufficient time for probe to stabilize to sample temperature and dissolved oxygen concentration.
2. Read dissolved oxygen value. Record appropriate data on field forms.

### **2.1.1 Dissolved Metal Field Filtration Method**

#### Surface Water:

1. Use a disposable, high capacity, pre-cleaned, vacuum-type, .45-micron filter for each sample.
2. Visually inspect funnel, filter, and plastic hose for damage. Replace parts or repair equipment as necessary.
3. Attach a section of plastic hose on both the inlet and outlet of the filter. Insert funnel into end of plastic hose (pre-filter end). Fill funnel and let approximately 3 volumes of sample water pass through hose and filter.
4. If sample water is extremely turbid use the same procedure but pre-filter the water (usually with a 3-micron filter) and then use the .45-micron filter.
5. Fill sample container to appropriate level with filtered sample.
6. Repeat step 6 until all sample bottles are filled.
7. If sample water is extremely turbid use the same procedure but pre-filter the water (usually with a 3-micron filter) and then use the .45-micron filter.
8. Decontaminate all non-disposable equipment following use.

#### Groundwater:

1. Place disposable, high capacity, pre-cleaned, vacuum-type, .45-micron filter in two-way hose fitting/reducer fitting after restricting flow to one outlet.
2. After inserting filter firmly into the two-way hose fitting adjust valves so as to divert flow through the filter.
3. Let at least three filter volumes run through the filter before filling sample bottles.